IMPLEMENTATION WORK PLAN
REVISION 1
ANACONDA EVAPORATION POND REMOVAL ACTION
(THUMB POND AND SUB-AREA A)
YERINGTON MINE SITE

June 18, 2010

PREPARED FOR:

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LIST OF ACRONYMS AND ABREVIATIONS

ACCU	Automatic Cartridge Collection Unit
AOC	Administrative Order on Consent
AQM	Air Quality Monitoring
ARC	Atlantic Richfield Company
ASTM	American Society for Testing and Materials
BLM	Bureau of Land Management
BMP	Best Management Practices
CERCLA	Comprehensive Environmental, Response, Compensation, and LiabilityAct
DSR	Data Summary Report
EPA	Environmental Protection Agency
ESI	Environmental Standards, Inc.
HASP	Health and Safety Plan
JSA	Job Safety Analyses
LEP	Lined Evaporation Pond
mph	miles per hour
MWMP	Meteoric Water Mobility Procedure
NAD	North American Datum
NDEP	Nevada Department of Environmental Protection
NGVD	National Geodetic Vertical Datum
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Levels
PPE	Personal Protective Equipment
psi	pounds per square inch
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
QAPP	Quality Assurance Project Plan
RAP	Removal Action Plan
RI/FS	Remedial Investigation/Feasibility Study
Site	Yerington Mine Site
SOP	Standard Operating Procedures
SOW	Scope of Work
SWCC	Soil Water Characteristic Curve
TIN	Triangulated Irregular Networks
TSEA	Task Safety and Environmental Analyses
UEP	Unlined Evaporation Pond
USCS	Unified Soil Classification System
VLT	Vat Leach Tails
WRA	Work Risk Assessment
XRF	X-Ray Fluorescence

amsl	above mean sea level
bcy	bank cubic yards
bgs	below ground surface
cm/s	centimeters per second
cu. yds.	cubic yards
L	liter
mg	mg milligram
mg/m3	milligrams per cubic meter
pCi	picoCurie
µg/m3	micrograms per cubic meter

SECTION 1.0
INTRODUCTION

This revised Implementation Work Plan has been developed in support of the placement of interim covers for the Thumb Pond and a portion of the Anaconda Sulfide Tailings Area known as Sub-Area A, as presented in the Administrative Order on Consent (AOC) and associated Scope of Work (SOW)[1]. The AOC/SOW was issued to the Atlantic Richfield Company (ARC) by the U.S. Environmental Protection Agency - Region 9 (EPA), dated April 21, 2009, with an effective date of May 1, 2009. The Thumb Pond and Sub-Area A are located on the Yerington Mine Site (Site) in Lyon County, Nevada (Figure 1-1). Figure 1-2 shows the location of these areas and the operable units identified by the EPA in the Administrative Order for the Anaconda/Yerington Mine Site (EPA Docket No. 9-2007-0005), issued by EPA to ARC on January 12, 2007. The removal action scope for the former Anaconda Evaporation Ponds (the Thumb Pond is one of several inactive evaporation ponds) and Sub-Area A was defined in the AOC/SOW as follows:

Respondent shall provide and implement a design plan to limit the ponding of low pH, metalliferous water in the lined evaporation ponds to the northwest within the Site to prevent to the extent feasible threats to wildlife as determined by EPA. The design plan also shall include proposed measures to limit the migration of dust containing hazardous substances from the lined and unlined evaporation ponds to the northwest within the Site, and those areas known as the "Thumb Pond" and the "Sulfide Tailings Area" (see Figure 1), the schedule for the plans submissions are set for the in Table 1.

Respondent shall submit a design plan that shall include the use of Vat Leach Tails ("VLT") fill material. Respondent shall also submit an implementation work plan for the construction of a VLT cap to be installed over the lined and unlined evaporation ponds, including enhancing the deteriorated cap at the Thumb Pond and capping the area identified as "Sub-Area A" in Figure 1. The thickness of the VLT cap shall be sufficient to mitigate standing water within the lined evaporation ponds, and to mitigate the generation of fugitive dust from the underlying sediments in the lined, unlined, Thumb Pond and "Sub-Area A" in Figure 1. The average thickness of the

[1] Administrative Order on Consent and Settlement Agreement for Removal Action and Past Response Costs Anaconda Copper Mine, Yerington Nevada; U.S. EPA Region IX; CERCLA Docket No. 09-2009-0010.

VLT cap will be 18 inches. Portions of the VLT cap may be thicker or thinner than 18 inches as appropriate based on engineering and design requirements to meet the stated objectives. Finally, Respondent shall submit a removal action report after completion of the work.

The term 'Cap' referenced in the SOW and the term 'cover' referenced in this revised Implementation Work Plan refers to the use of inorganic VLT fill materials as interim covers. The removal action objective for the Thumb Pond and Sub-Area A covers is to limit the migration of dust containing hazardous substances.

This revised Implementation Work Plan does not address the Lined Evaporation Pond (LEP) and the Unlined Evaporation Pond (UEP), which were included in the Draft Implementation Work Plan dated November 4, 2009. The decision to defer the interim covers for the LEP and UEP was presented to ARC by EPA in correspondence dated March 18, 2010, which also: 1) noted the need to develop a Potential Cover Materials Work Plan to address alternative materials sources for the LEP and UEP interim covers; and 2) approved the revised *VLT Characterization Work Plan Using X-Ray Fluorescence* (XRF Work Plan) dated November 13, 2009 (Brown and Caldwell, 2009a). Based on the results of a teleconference with EPA on May 10, 2010, this revised Implementation Work Plan also describes a post-construction sub-surface investigation of alluvial soils and groundwater beneath Sub-Area A to establish existing conditions, which was not included in the Draft Implementation Work Plan.

This revised Implementation Work Plan presents the basis of design for implementing the removal action including design assumptions, supporting geotechnical test data and project execution procedures. Section 2.0 describes existing Thumb Pond and Sub-Area A conditions, and the condition of the two VLT borrow areas that will be the source of the cover materials. Geotechnical test results for the Thumb Pond, Sub-Area A, and VLT borrow source areas are described in Section 3.0. Section 4.0 presents the cover design concepts to be used to achieve the removal action objective of mitigating potential generation of fugitive dust from the Thumb Pond and Sub-Area A.

Section 5.0 describes material quantities, haul roads and construction water elements of the removal action. Section 6.0 describes construction-related monitoring including XRF screening of VLT materials at the two borrow source areas and air quality monitoring (details of XRF screening will be provided in a supplementary technical memorandum to EPA). Section 7.0 describes the approach for executing the removal action. Section 8.0 presents the proposed sub-surface investigation of alluvial soils and groundwater beneath Sub-Area A. Section 9.0 summarizes worker health and safety requirements for the removal action and sub-surface investigation.

An updated schedule for the Evaporation Ponds Removal Action is presented in Section 10.0, which integrates: 1) the planned construction of interim covers for the Thumb Pond and Sub-Area A in 2010; 2) the XRF Work Plan Data Summary Report (DSR); 3) the Cover Materials Work Plan; and 4) the planned construction of interim covers for the LEP and UEP in 2011. References cited in this revised Implementation Work Plan are listed in Section 11.0.

As described in the Draft Implementation Work Plan and discussed in the May 10, 2010 conference call with EPA, ARC anticipates that the final engineering design and construction approach for the Thumb Pond and Sub-Area A interim covers may be modified as a result of ARC's procurement process, and discussions with the selected contractor. Thus, the plan sheets and technical specifications presented in this revised Implementation Work Plan may be modified. Once a final design and construction approach is achieved in concurrence with the contractor that will be consistent with the design, construction and monitoring elements presented herein, ARC will transmit any updated engineering and construction information to EPA prior to the start of construction (this submittal is included in the integrated project schedule).

SECTION 2.0
EXISTING SITE CONDITIONS

As shown in Figure 1-2, the Thumb Pond and Sub-Area A are in close or reasonable proximity to the Oxide Tailings Area (OU-6), which will provide the VLT materials to be used in the removal action. The following descriptions of the Thumb Pond, Sub-Area A and the Oxide Tailings Area provide the framework for implementing the major removal action elements (i.e., access road construction and cover designs).

2.1 Thumb Pond

The Thumb Pond, the largest and oldest of the Finger Ponds, was constructed to contain calcine tails and other dust precipitates that resulted from the roasting of imported sulfur ores. This pond was approximately 4,500 feet long by 600 to 1,000 feet wide as originally constructed. However, the southern two-thirds were covered by the Arimetco Phase IV VLT Heap Leach Pad and VLT fill.

The exposed portion of the Thumb Pond currently covers about 69 acres and has been capped with 8 to 12 inches of VLT materials. The capping was performed by a previous Nevada Department of Environmental Protection (NDEP) removal action in 2003. The Thumb Pond is well defined by berms to the north and east, a tapered berm along the west and blends into existing grade on the south. The southwest corner merges with an adjacent Finger Pond (FEP-4).

The thickness of sediments in the Thumb Pond varies from one inch thick to a maximum thickness of 11.5 feet. The sediments generally consist of homogeneous, very fine-grained silt. Localized areas within the Thumb Pond exhibit a thin cap, resulting from erosion, which can be scraped to reveal the underlying red sediments. In areas of thicker accumulations of pond sediment, a zone of saturated red pond sediment was encountered immediately above the alluvial soils, and the underlying soils appeared to consistently have limited moisture content (i.e., a hydraulic boundary condition appears to locally occur at this interface).

2.2 Sub-Area A

Sulfide tailings resulted from the sulfide ore beneficiation process (i.e., fine crushing and copper sulfide recovery by chemical flotation), in which lime was used to maintain a basic pH solution. The fine-grained tailings were deposited as slurry in designated sections of the tailings impoundment that expanded to the north over time. Decanted water was pumped back to the process circuit via water recycling ponds, which are located on both private and BLM land.

Some of the recycling ponds may have also been used to evaporate spent process solutions from the oxide ore leaching process. The sediments in these ponds appear to consist of homogeneous reddish to grayish clay-size particles. Some of the ponds have been covered with VLT materials. Sub-Area A occurs within the area of the recycling ponds in the southern Sulfide Tailings Area, and covers approximately 7.2 acres. Seasonal low pH water accumulates in a portion of Sub-Area A, in a low area where precipitation collects against the northern and eastern perimeter berms (the western and southern portions are bounded by generally dry tailings).

2.3 Oxide Tailings Area (Borrow Source Areas)

The approximate 500-acre Oxide Tailings Area, primarily located on private land, is composed of multiple benches and ‘end-dump’ mounds of VLT with an average height of over 100 feet. Slopes up to 80 feet high exist on the north, west and southeast portions at or near the angle of repose. Access to the tailings is via roads and ramps from the Phase IV-VLT Heap Leach Pad and from the north and south margins of the tailings area. The two borrow areas identified in Figure 1-2 outline the portions of the Oxide Tailings Area where VLT, as specified in the AOC/SOW, will be excavated for Pond cover and road building materials.

The VLT materials are spent oxide ores that were crushed to a specific maximum size and leached with sulfuric acid solutions in concrete vats. The spent ore material classifies as coarse-grained poorly graded sands with silts and gravels (i.e., half to three-quarter inch size fractions with finer grained sand-, silt- and clay-size particles). VLT materials have been previously used by Anaconda and Arimetco for building roads and pads, and have subsequently been used by EPA and NDEP in past removal actions.

SECTION 3.0
SURVEYING AND GEOTECHNICAL TESTING

The design concepts described in Section 4.0 are based on geotechnical test results presented in Appendix A and the pre-construction topographic surveys of the Thumb Pond and Sub-Area A. These data support the design basis (Appendix B) and the plan sheets (Appendix C) for the removal action.

Survey Information

Survey information for the removal action design has been provided by Tri State Survey located in Carson City, Nevada with initial project survey controls established by Lumos Engineering, also located in Carson City. The coordinate basis for the surveys is Nevada State Plane, West Zone using the 1927 North American Datum (NAD 27) in grid coordinates. The vertical elevations are relative to the 1929 National Geodetic Vertical Datum (NGVD 29). The basis of elevation is established on National Geodetic Survey Monuments E320 (4417.05 feet) and E321 (4332.69 feet).

The survey information meets the minimum requirements for a Third Order Class I survey with an accuracy of 1 part in 10,000. Surveys were completed on 100-foot grids and the results are presented in the plan sheets provide as Appendix C (plan sheets numbered 138555-C-010 [Base Control], C-011 [Thumb Pond] and C-012 [Sub-Area A]) will be used to verify material placement and thickness during construction, with final (post-construction) survey information to be provided in the Removal Action Report.

Geotechnical Testing

Geotechnical tests for sulfide tailings shear strength values and VLT material index characteristics were performed to support the removal action design. Index testing results are presented in Appendix A, and described below. Shear testing of Sub-Area A tailings provide for the basis of design calculations (Appendix B), including the interim covers to be placed over a portion of Sub-Area A that exhibits seasonal standing water and saturated conditions.

VLT index testing included the collection of samples from fourteen trenches varying from 10 to 20 feet deep in the north and south borrow source areas using a John Deere LC-160 tracked excavator (5.4 psi ground pressure). Bulk samples were taken at five-foot intervals in each trench, with an additional sample composited over the length of each trench, for gradational, plasticity and moisture density analyses. Test pads were constructed using the VLT materials from each trench, at field moisture to approximate VLT placement conditions without moisture conditioning. The 18-inch thick test pads were compacted by four passes of the tracked excavator (compaction efforts were monitored by nuclear density gauge for density and moisture). The results of these tests, provided in Appendix A, support the basis of design for the covers (Appendix B).

Tests were conducted on Sub-Area A tailings to determine in-situ Torvane shear strengths, and in-situ moisture and density data for these fine grained materials using a nuclear gauge (Appendix A). Torvane shear test data were plotted, and interpolated by contouring, to produce the shear strength maps presented in the design plans (plan sheet 138555-C-020 for Sub-Area A provided in Appendix C). The Thumb Pond was not tested for in-situ shear strength because of the presence of the existing VLT cover materials, placed during a previous removal action. Geotechnical test results are provided in Appendix A, which summarizes the testing program conducted over several months in 2009 as saturated portions of Sub-Area A became accessible and additional data collected in 2010 for the south VLT borrow area.

SECTION 4.0
INTERIM COVER DESIGNS

As indicated in Section 1.0, the AOC/SOW describes two functions for the Evaporation Ponds Removal Action: 1) dust mitigation covers for the Thumb Pond, UEP and Sub-Area A; and 2) mitigation of seasonal standing water within portions of the LEP (i.e., 'wet areas'). The dust mitigation cover design objectives for the Thumb Pond and Sub-Area A are generally similar in scope to previously implemented NDEP and EPA removal actions, used to suppress fugitive dust generation by providing a relatively coarse grain material cover over existing fine grained exposed Pond sediments and tailings. The AOC/SOW specifies the use of VLT materials for these covers, which was confirmed by the March 18, 2010 EPA correspondence.

Dust mitigation covers previously constructed by NDEP and EPA utilized compacted VLT materials borrowed from the Oxide Tailings Area, or from existing berms or dikes, which were proximal to dust-prone areas to provide access for large rubber-tired (60 psi ground pressure) and tracked equipment. The cover design concepts described herein are similar, with an average cover thickness of 18 inches that will generally follow existing topography without abrupt thickness changes to account for localized variable terrain. The geotechnical data indicate that the VLT cover materials can be placed with little to no moisture conditioning and be compacted to an 85 percent standard proctor (ASTM D 698).

The VLT material will need minor moisture conditioning to achieve the 90 percent modified proctor density (ASTM D 1557) for the haul road compaction effort. Although ARC anticipates that rubber-tired equipment will be used, the selected contractor will select the means and methods that are consistent with this revised Implementation Work Plan to: 1) perform the removal action based on the geotechnical data presented in Appendix A; and 2) limit deformation (i.e., no greater than one-inch) during the placement of the cover materials.

Shear testing of the locally saturated tailings and sediments within Sub-Area A (Appendix A) indicated insufficient strength to support rubber tired equipment directly, or with the assistance of cover materials within the specified average cover thickness of 18 inches. To facilitate the use of rubber-tired equipment for the placement of this interim cover, bi-axial geo grid will be required to stabilize the tailings for the stockpiling and staging area (see Appendix B and Appendix C plan sheet 138555-C-211). The geosynthetic material will increase the shear strength of the underlying sulfide tailings and sediments by direct mechanical interlocking with the VLT cover materials at the interface between the two material types. This mechanism will support the use of heavy construction equipment over the relatively soft sulfide tailings and sediments and the initial use of rubber-tired equipment on the planned Sub-Area A staging area. Pending approval by ARC, the contractor may extend the bi-axial geo grid on to other portions of Sub-Area A to expedite the construction schedule.

SECTION 5.0
MATERIAL QUANTITIES, HAUL ROADS AND CONSTRUCTION WATER

This section describes the volume of materials to be used in the removal action, construction requirements for haul road improvements and the construction water source.

5.1 Material Quantities

The estimated net amount of materials to be excavated is about 88,800 bank cubic yards (bcy), of which approximately 75,500 cubic yards (cu. yds.) will be used for the interim covers and 11,300 cu. yds. for compacted road base. VLT materials for the Thumb Pond cover will be supplied from the north VLT borrow area, and the materials for Sub-Area A will be excavated from the south VLT borrow Area (Figure 5-1). VLT materials in berms along the South VLT road and adjacent to Sub-Area A will be used to develop or improve access roads between the south VLT borrow area and Sub-Area A. A summary of anticipated cut and fill volumes for the removal action is summarized in Table 5-1.

Material quantities for the pond covers were calculated using AutoCAD Civil 3D 2010 software (Appendix D) using the average end area method and triangulated irregular networks (TINs). Existing surface TINs were constructed using the survey data presented in Appendix C (plan sheets numbered 138555-C-010 [Base Control], C-011 [Thumb Pond] and C-012 [Sub-Area A]). Cover elevation TINs were developed for the Thumb Pond and Sub-Area A by raising the existing survey data points by a minimum of 18 inches to create the design cover surface and thickness. Fundamentally, this is an area x height = volume calculation.

Table 5-1. Summary of Estimated Evaporation Pond Quantities

Pond	Cut (cu. yds.)	Fill (cu. yds.)	Net (cu. yds.)
Thumb Pond	1,010	44,976	43,966 (Fill)
Sub-Area A	126	31,668	31,542 (Fill)
		TOTAL:	**75,508 (Fill)**

5.2 Haul Roads

Haul roads from the VLT borrow source areas to the Thumb Pond and Sub-Area A will be confined to existing roads and disturbed areas. The roads will be graded, widened and extended to improve equipment access. Haul road designs were developed utilizing the guidance provided in 'Haul Road Inspection Book' (PH99-I-4, MSHA, 1999), and are intended to facilitate the use of a Caterpillar 740 articulated haul truck (43.5 ton capacity) as the largest unit. Under this guidance, the proposed haul road designs have incorporated the following:

- Site wide speed limit is 25 miles per hour (mph);
- Standard road width of 30 feet for a one-way haul road, 60 feet for a two-way haul road, and a 12-foot maintenance vehicle lane with a 6-foot shoulder;
- Access ramps or inclines would be limited to 10 percent maximum grade;
- A center berm will be constructed on the two-way north VLT haul road access ramp;
- Maximum downhill ramp speed of 10 mph;
- New Roads would have a Minimum Curve Radius of 130 feet, a Speed Limit of 20 mph, a curve embankment of 4 percent (curve embankment phased out at curve radius exceeding 160 feet), and would accommodate extra lane widths based on curve radius;
- Existing Roads would be graded to maintain existing grades and established drainages, and would be widened as necessary to attain minimum lane width requirements; and
- Road berms will be constructed per the requirements of 30 CFR 56.9300.

More narrower haul roads may also be used, but would require the contractor to re-design the haul roads to the reference guide at the contractor's expense. Traffic plans will be developed for the Site during the removal action to separate heavy equipment from other light vehicle traffic performing routine Site operational and maintenance activities and remedial investigation activities. Enhanced traffic controls will be imposed for alignment not attaining the design guidance criteria (reduced speed limits, flaggers, etc.). Figure 5-1 illustrates the work areas for the removal action, including the existing and new roadways. The access road from the North VLT Borrow Area (Figure 5-1) to the Thumb Pond is located between the northwest border of the VLT Heap Leach Pad and the Finger Ponds. A section of this road will encroach about 20 feet on to the Finger Ponds to attain the 60-foot width. Roads will either be crowned or sloped to promote positive drainage off the road surface.

Grading requirements are provided in the design for access roads and ramps into the VLT borrow source areas (Appendix C), which will result in a final configuration to maintain post-removal action access roads and storm water controls. The relatively small South VLT borrow area will be excavated to allow for the management of potential surface water runoff using low maintenance best management practices (BMPs). The North VLT Borrow Area will remove the necessary cover material volume for the Thumb Pond by lowering the existing first bench at the North VLT borrow site by approximately 4 to 7 feet. The post-removal action design for this area utilizes a gentle slope to provide storm water control with low maintenance BMPs.

The primary haul roads to Sub-Area A from the South VLT Borrow Area will utilize existing roads and berms within the Sulfide Tailings Area. Existing roads and berms will require grading and extensions to allow their connection to the roadways shown on Figure 5-1. The low shear-strength portion of the haul road adjacent to Sub-Area A will be a staging area for the haul equipment. As this staging area progresses into the Sub Area A, the pad will require support (i.e., bi-axial geo-grid geosynthetic material) to establish a stabilized staging pad over (near) saturated tailings. Additional VLT materials may also be placed in these areas pending contractor selection of means and methods.

5.3 Construction Water

The removal action (i.e., excavation of borrow areas, road construction and improvements, placement of VLT covers) will require construction water for compaction and dust suppression. Previous removal actions used water from the Tibbals Well located south of Burch Drive and adjacent to the open pit (Figure 5-1), and the contractor will be required to make the necessary improvements to access the Tibbals Well and provide locations for temporary storage tanks, if needed (Appendix C plan sheets 138555-C-001 and C-100). ARC will work with the contractor, as needed, to facilitate access to this water supply source. Appendix E presents the technical specifications for the contractor to bid the project including the covers, haul roads and construction water.

SECTION 6.0
CONSTRUCTION-RELATED MONITORING

Monitoring during the removal action will include: 1) field screening of metal concentrations in the VLT borrow source areas using a field-portable X-Ray Florescence (XRF) device; and 2) air quality monitoring (cover performance monitoring is briefly discussed in Section 7.0). Details and standard operating procedures (SOPs) for the XRF field screening program will result from the characterization data to be presented in the DSR, which will be presented to EPA prior to the start construction. As noted in Section 1.0, discussions with the selected contractor may modify the SOPs. As indicated in the Draft Implementation Work Plan, ARC anticipates that one sample per 5,000 cubic yards of VLT material will be subject to the field screening procedure (equivalent to one sample per two acres of cover at an average thickness of 18 inches).

The following sections provide a summary of fugitive dust control measures and associated air quality monitoring. Additional information is provided in Appendix E Technical Specifications, *01520 - Dust and Emissions Control/Monitoring*. This specification requires that the contractor prepare and submit a Dust Control and Air Monitoring Plan for approval by ARC prior to the commencement of earthwork. The Plan will describe the potential work activities, Site sources (e.g., stockpiles), and ambient conditions that may generate or exacerbate fugitive dust as well as the methods that the contractor will employ to control fugitive dust generated from the activities. The Plan will describe any chemical dust suppressants, dust palliatives, and/or dust entrainment materials (including water) and application details (e.g., equipment, location, rate, and total volume). The Plan will explain how fugitive dust control methods will be tailored to the various phases/stages of executing the work. ARC will provide EPA with a copy of the contractor's Dust Control and Air Monitoring Plans for review and approval.

The objectives of the air quality monitoring to be conducted during the Evaporation Pond removal action are to:

- Evaluate the effectiveness of fugitive dust control measures; and
- Document concentrations of chemicals at the perimeter of the Site.

Removal action activities that have the potential to generate dust include the following:

- Earthwork activities such as excavating, loading/unloading, stockpiling, compacting, and grading;
- Wind erosion of project materials from VLT borrow areas or stockpiles staged for capping; and
- Vehicle transportation on haul roads.

Fugitive dust controls that may be implemented include the following:

- Placing rumble plates or rock at exits to the Limit of Work;
- Applying physical or chemical dust suppressants, dust palliatives, and/or dust entrainment materials to disturbed surfaces;
- Covering stockpiles;
- Minimizing vehicle speed on haul roads; and
- Tarping, dry-brushing, or cleaning vehicles

To evaluate the effectiveness of fugitive dust controls, five temporary air monitoring stations (EP-1 through -5) will be located near the primary borrow source, along haul roads, and in typical upwind/downwind locations to capping areas, as shown in Figure 5-1. The rationale for these locations is summarized below.

- EP-1: located near the northern VLT borrow source. This location monitors fugitive dust that may be generated from earthwork activities at the northern VLT borrow source. This location also serves as a typical upwind location for the Thumb Pond.
- EP-2 and EP-3: located east (EP-2) and north (EP-3) of the Thumb Pond. These locations monitor fugitive dust that may be generated from capping activities and hauling near the Thumb Pond. These locations also serve as typical downwind locations for the Thumb Pond.
- EP-4 and EP-5: located south (EP-4) and north (EP-5) of Sub Area A. These locations monitor fugitive dust that may be generated from capping activities and hauling near Sub Area A. These locations also serve as typical upwind (EP-4) and downwind (EP-5) locations for the Sub Area A.

Each station will be equipped with a real-time PM10 meter capable of providing 15-minute measurements for 8 core hours of the construction day. The meter will be a Thermo Electron aDR-1200S Ambient Particulate Monitor (or equivalent) that features a tripod, a rechargeable battery pack, a real-time display, a data logger, a programmable PM10 Notification Level, and a visual/audible alarm system. Operation and calibration of the meter will be conducted per the manufacturer specifications. The monitors are calibrated at the factory prior to shipment and will be zeroed by ARC field staff prior to each day of operation. The meter will be positioned approximately 2 meters above ground surface at each location. Data will be downloaded from the datalogger on a daily basis and the batteries will be recharged overnight. Data will be stored in the Site database and provided to EPA following data quality review on a weekly basis during the construction activity.

This type of real-time monitoring combined with PM10 notification levels provides the Construction Manager with a real-time, numerical method of evaluating the effectiveness of fugitive dust control measures and the ability to quickly communicate to the contractor when the measures need to be increased or when removal action activities need to be modified to control dust. Notification Levels for the field effort are provided in Table 6-1 along with the corresponding field responses and personnel notifications. Although the Notification Levels are based on a 15-minute average PM10 concentration beginning with 0.5 milligrams per cubic meter (mg/m^3), the visual/audible alarm system will be programmed for an instantaneous PM10 measurement of 0.5 mg/m^3 to indicate that construction activities may be generating excessive dust in a localized area.

To document concentrations of chemicals at the perimeter of the Site during the Evaporation Pond removal action, three of the permanent perimeter air monitoring stations (AM-2, AM-5, and AM-6) used in the 3-year air quality monitoring program (Brown and Caldwell, 2009b) will be re-commissioned. These stations were selected because they are located upwind (AM-2) and downwind (AM-5 and AM-6) of the main area of activity along the direction of predominant wind direction at the Site (i.e., from southwest to northeast when wind velocity is greater than 10 mph). A combination of high volume air samplers, a continuous particulate monitor, and a meteorological station will be used as summarized in Table 6-2.

Table 6-1. PM10 Notification Levels for Evaluating the Effectiveness Fugitive Dust Controls

Notification Level	Level 1	Level 2	Level 3
PM10 Concentration (15-min average)	0.5 mg/m^3	1.0 mg/m^3	2.5 mg/m^3
Construction Contractor Response	Increase fugitive dust control measures.	Increase fugitive dust control measures.	Stop work temporarily. Increase fugitive dust control measures and/or modify work practices.
Construction Manager Response	Visually monitor meter display to verify PM10 concentration falls below Level 1.	Visually monitor meter display to verify PM10 concentration falls below Level 1.	Meet with Construction Contractor to discuss additional measures and/or modified work practices. Visually monitor meter display to verify PM10 concentration falls below Level 2.
Personnel Notification	Construction Contractor, ARC Project Manager.	Construction Contractor, ARC and EPA Project Managers.	Construction Contractor, ARC and EPA Project Managers. Approval from ARC and EPA Project Managers is required to resume work.

Table 6-2. Summary of Perimeter Monitoring Equipment and Operation

Equipment	Station(s)	Operation
High Volume PM10 Air Sampler	AM-2, AM-5, and AM-6	Collect samples at all 3 stations: on 2 events prior to start of earthwork activities (background conditions), on 2 events during first week of full-scale operations (startup period); and monthly events thereafter (construction period). Additional samples collected if Notification Level 3 exceeded at any time.
Continuous Particulate Monitor	AM-6	Continuously measure PM10 concentration during construction activity. If 1-hour PM10 concentration exceeds 300 µg/m^3, activate ACCU system and collect sample on filter cassette.
Meteorological Monitoring	AM-6	Continuously measure 15-minute wind speed and direction during construction activity. If any 15-miute average wind speed exceeds 25 mph, temporarily stop work until wind speed falls below this level.

Each station will be equipped with a high volume air sampler that will collect a filter sample for analysis of PM10, sulfate, eight metals (aluminum, arsenic, cadmium, chromium, cobalt, copper, manganese, and nickel), and five radiochemicals (gross alpha, radium-226, radium-228, thorium-228, and thorium-230). The high volume air samplers will be the same as those used in the 3-year air quality monitoring program: the Tisch Environmental TE-6070D High Volume PM10 monitors with EPA Federal Reference Method (FRM) designation RFPS-0202-141. High volume samples will be collected before and during the removal action.

To establish background conditions, an 8-hour high volume sample will be collected from all three monitoring locations on two occasions prior to the start of earthwork activities. To evaluate concentrations of chemicals at the perimeter of the Site during the startup of the removal action, an 8-hour high volume sample will be collected from all three monitoring locations on two occasions during the first week of full-scale operations. For the remainder of the construction period, an 8-hour high volume sample will be collected from all three monitoring locations on a monthly basis. The duration of these startup and monthly samples will coincide with the core daily construction activity, which is estimated to be between 8 and 10 hours, and sampling will be designated on random days during the construction week. Additional samples will be collected if Notification Level 3 is exceeded at any time.

Station AM-6 will also be equipped with a continuous particulate monitor capable of providing 15-minute PM10 measurements continuously throughout the construction activity. The real-time air sampler will be the same as that used in the 3-year air quality monitoring program: the Thermo Scientific TEOM Series 1400a Ambient Particulate Monitor with FRM designation EQPM-1090-079. The TEOM features an Automatic Cartridge Collection Unit (ACCU) intelligent sampling system so that sample collection on a filter cassette will be triggered by particulate concentration. When the 1-hour average PM10 concentration at AM-6 exceeds 300 $\mu g/m^3$, sample collection will begin on a 47-mm Teflon filter cassette. The ACCU system will continue to sample as long as the 1-hour average PM10 concentration at AM-6 exceeds 300 $\mu g/m^3$. The sample duration will be set for a minimum of two hours and a maximum of eight hours. The ACCU filter will subsequently be analyzed for PM10 using gravimetry, metals using XRF spectroscopy, and sulfate using ion chromatography.

Data from the existing, continuously-operating meteorological station at AM-6 will be used to interpret the perimeter air monitoring data and monitor wind speeds during the removal action. Among other parameters, the station is capable of providing continuous 15-minute average measurements of wind speed and direction. If any 15-minute average wind speed exceeds 25 mph, the Construction Manager will notify the contractor to stop work temporarily until wind speed falls below this level.

To maintain consistency with the quality of ambient air data collected previously at the Site, the same quality control procedures will be followed as specified in the *Air Quality Monitoring Work Plan, Yerington Mine Site, Revision 2* (BC, 2007) and the *Quality Assurance Project Plan, Revision 5* (ESI and Brown and Caldwell, 2009). The quality control procedures include:

- Standard operating procedures for equipment operation, maintenance, and calibration;
- Quarterly maintenance and calibration of high volume air samplers and the continuous particulate monitor;
- Semi-annual maintenance and calibration of all meteorological equipment;
- Filter blanks and field blanks for high volume air samples;
- Laboratory quality control samples consisting of method blanks, laboratory control samples, and laboratory duplicate samples as specified in the QAPP;
- Data verification, validation, and management; and
- Reporting to the EPA.

SECTION 7.0
REMOVAL ACTION EXECUTION

The removal actions for the Thumb Pond and Sub-Area A are conventional earth moving operations, which are subject to EPA review and reporting requirements and ARC's health and safety requirements. Upon completion of the removal action for these two areas, ARC will submit draft and final Removal Action Reports to EPA. The removal action construction period will be influenced by the type of equipment that the selected contractor utilizes (e.g., means and methods), which may differ from the equipment production anticipated by ARC (Appendix F). The construction schedule (August through November 2010) anticipates the use of articulated haul trucks to complement the standard construction fleet of front-end loaders and tracked dozers. Because of the need to conduct the subsurface investigation for Sub-Area A prior to late October 2010, this interim cover will need to be placed first.

This revised Implementation Work Plan provides the contract documents for providing the general and supplemental conditions under which the project work will be executed. The framework of the design documents will be in the standard format of contract documents (including appended conditions), plans and technical specifications. This format provides ARC the opportunity to solicit bid prices on a competitive basis for efficient and safe execution of the work.

Quality assurance and quality control (QA/QC) activities will be completed by a third-party contractor for project safety and performance. ARC anticipates that an agreement with the supplier(s) of construction water will be included with the design bid documents or ARC will directly contract with the supplier(s). In addition, a memorandum of understanding between ARC and EPA may be necessary for the execution of the removal action given the expected presence of EPA inspection personnel or contractors in the removal action work areas. Placement of fill materials will be subject to performance-based monitoring for cover thickness and density characteristics. As presented in Appendix C (plan sheets numbered 138555-C-010 [Base Control], C-011 [Thumb Pond] and C-012 [Sub-Area A]), the design includes base surveys of the pond areas completed on 100-foot grids for the interim covers.

Verification of contractor performance (and the basis for payment) will be based on the comparison of the final cover elevation at each survey grid point with the pre-removal action elevation. The cover design plan sheets show the base survey grid location with the minimum elevation added to the pre-removal action surveyed elevation that the contractor will need to attain for payment (payment quantities will be based on the volume of cover materials defined within the triangles created by adjacent surveyed locations).

Concurrent with the elevation survey verification process, the contractor will verify that the covers are placed in a manner to achieve the specified density values. ARC will solicit bids from prospective contractors that meet ARC technical qualifications, equipment availability, and health and safety requirements. Preliminary health and safety requirements are discussed in Section 9.0, and a detailed health and safety plan will be developed after the contractor selection process, which will also be submitted to EPA prior to the start of the removal action.

SECTION 8.0
SUB-AREA A SUBSURFACE INVESTIGATION

This section of the revised Implementation Work Plan describes a field investigation intended to: 1) provide detailed geochemical and geotechnical data associated with the newly installed VLT interim cover, underlying sulfide tailings and native alluvium; 2) construct a groundwater monitor well in the uppermost portion of the alluvial aquifer beneath immediately beneath Sub-Area A to evaluate potential future impacts to groundwater quality from the placement of the VLT cover. Potential infiltration of meteoric water through the cover is not anticipated to occur until the precipitation season beginning in November 2010. Health and safety requirements for this investigation are described in Section 9.0.

8.1 Field Sampling and Analysis Plan for Solid Samples

Characterization of tailings and alluvial soils is based on the following sampling and analysis plan (FSAP): 1) drilling and logging of a characterization borehole, using a sonic core drilling rig; 2) collecting core samples for sub-surface materials to determine geochemical and geotechnical properties; 3) vadose zone modeling of the tailings-alluvial profile; and 4) compiling the field and analytical data into a data summary report (DSR). The schedule for these activities is presented in Section 9.0.

Core retrieved from the sonic core drilling rig will be described in accordance with ASTM 1992, Standard D 2487-92 - Classification of Soils for Engineering Purposes Unified Soil Classification System (USCS) and SOP-12 'Field Classification and Description of Soils and Rock' (Appendix G). Planned sample collection intervals listed below provide a higher density in the upper 50 feet of the vadose zone where soil moisture and soil suction values are anticipated to be more variable than deeper zones, as defined by Looney and Falta (2000) for (semi-) arid climates, as observed at the Site:

1. Land surface or boundary zone which is directly and immediately affected by episodic climatic events including precipitation, temperature, and wind. This zone extends from the surface to approximately 0.5 meters.
2. An intermediate zone extending from approximately 0.5 meters below ground surface to depth varying from 3 to as much as 10 meters in the semi-arid west. This zone acts to attenuate land surface climatologic effects, and will act as a short-term storage zone for infiltrated precipitation.
3. A deep vadose zone of virtually constant moisture content, in which the hydraulic gradient is unity, i.e. 1, and there is annual downward water flow. At the site this zone is estimated to extend from a depth of approximately 5 meters down to the capillary fringe estimated at approximately 2 to 3 meters above the water table.
4. A capillary fringe zone above the water table.

Pending lithologic logging results and the contacts between VLT cover-sulfide tailings and sulfide tailings-native alluvium, and the anticipated depth to groundwater beneath Sub-Area A of 90-95 feet below ground surface (bgs) based on March 2010 monitoring data (Brown and Caldwell, 2010), the planned core sample intervals for geochemical analyses include:

- from approximately 1 to 3 feet bgs
- from approximately 8 to 10 feet bgs
- from approximately 18 to 20 feet bgs
- from approximately 28 to 30 feet bgs
- from approximately 48 to 50 feet bgs
- from approximately 68 to 70 feet bgs
- from approximately 88 to 90 feet bgs

As needed, the above sampling intervals will be modified to ensure adequate geochemical characterization of all materials penetrated by the borehole (i.e., at least one VLT sample, two samples from the sulfide tailings, and two samples from the alluvial soils). A subset of the geochemical sample intervals listed above will be subject to the geotechnical analyses described below (i.e., one sample of each material type from the uppermost geochemical sample interval).

In accordance with SOP-11 'Soil Sampling' and SOP-1 'Environmental Sample Handling', samples for geotechnical analyses (minimum 12-inch long intact and undisturbed core sample) will be collected using a four-inch diameter Lexan core sleeve and immediately sealed and packaged to minimize loss of soil moisture and any disturbance during shipping by:

- Adding plastic bubble wrap inside the open ends of the core sleeve;
- Sealing both ends with plastic caps and duct tape to retain soil moisture;
- Placing the core inside a sealed plastic bag; and
- Packaging the samples in hard-sided shipping containers (e.g., cooler).

8.1.1 Geotechnical Analyses

Geotechnical characterization of the tailings and alluvial collected from Sub-Area A will include the analyses listed in Table 8.1.

Table 8-1. Geotechnical Parameters

Geotechnical Tests	Analytical Method
Hydraulic Properties/Soil Water Characteristic Curve:	
Saturated hydraulic conductivity (rigid-wall)	ASTM D2434
Initial gravimetric water content (soil moisture)	ASTM D2216
Dry bulk density	ASTM D2937/D6836
Calculated total porosity	ASTM D6836
Moisture characteristics (5-7 points)	ASTM D6836/D2325
Calculated unsaturated hydraulic conductivity	ASTM D6836
Particle Size Analysis:	
Standard sieves with wash and hydrometer	ASTM D422
Atterberg Limits:	
Liquid limit, plastic limit, plasticity index	ASTM D4318
Soil Classification for Engineering Purposes	
ASTM soil classification	ASTM D2487

8.1.2 Geochemical Analyses

The tailings and alluvial soil samples from the intervals listed above will be analyzed for the metals and radiochemicals listed in Table 8-2. Blank and duplicate soil samples will be collected in accordance with the Site-wide Quality Assurance Project Plan (QAPP - Revision 5; ESI and

Brown and Caldwell, 2009), and will be labeled in the same fashion, with no obvious indication of their sample location or quality. Field logs of sampling activities will be kept in accordance with SOP-3 'Field Notes and Documentation' (Appendix G).

Table 8-2. Geochemical Analytical Parameters

Analyte	Analytical Method(1)	Unit	Reporting Limit(1)
Metals			
Aluminum	6010B	mg/kg	10
Antimony	6020	mg/kg	0.1
Arsenic	6020	mg/kg	0.5
Barium	6020	mg/kg	0.5
Beryllium	6020	mg/kg	0.3
Boron	6010B	mg/kg	5
Cadmium	6020	mg/kg	0.06
Calcium	6010B	mg/kg	15
Chromium	6020	mg/kg	1.0
Cobalt	6020	mg/kg	0.5
Copper	6020	mg/kg	1.0
Iron	6010B	mg/kg	5.0
Lead	6020	mg/kg	0.5
Magnesium	6010B	mg/kg	10
Manganese	6020	mg/kg	0.5
Mercury	7471A	mg/kg	0.001
Molybdenum	6020	mg/kg	1.0
Nickel	6020	mg/kg	1.0
Potassium	6010B	mg/kg	50
Selenium	6020	mg/kg	0.00015
Silver	6020	mg/kg	0.5
Sodium	6010B	mg/kg	50
Thallium	6020	mg/kg	0.5
Thorium (total)	6020	mg/kg	0.5
Uranium (total)	6020	mg/kg	0.5
Vanadium	6020	mg/kg	1.0
Zinc	6020	mg/kg	10
Radiochemicals			
Radium-226	EPA 903.0	pCi/g	1.0
Radium-228	EPA 904.0	pCi/g	1.0

Note: (1) Laboratory analytical methods and reporting limits are consistent with the QAPP (Rev.5)

The Meteoric Water Mobility Procedure (MWMP; ASTM E2242) will be conducted on a VLT sample, a sulfide tailings sample and a shallow alluvial soil sample immediately below the sulfide tailings contact. The MWMP consists of a single-pass column leach test over a 24-hour period using Type II reagent-grade water of a quality and pH that reflects anticipated climate conditions in Nevada, including the Site. The purpose of the MWMP is to evaluate the potential for the mobilization of the metals and radiochemicals listed in Table 8-2 from these materials. Chemical analysis of the three leachate samples will be analyzed for the same suite of parameters used for Site-wide groundwater monitoring, reproduced in Table 8-3. Because the MWMP requires approximately 10 pounds of sample, a minimum 1.5-foot length of four-inch core will be required for each of the three samples, adjacent to the planned sample intervals listed above.

8.2 Monitor Well Installation and Groundwater Sampling

A groundwater monitor well with a nominal 20-foot screen interval will be constructed in the Sub-Area A characterization borehole. Once constructed, the monitor well will be developed and surveyed, and incorporated into the network of wells subjected to quarterly monitoring pursuant to the *Groundwater Monitoring Plan - Revision 1* dated December 15, 2009 (Brown and Caldwell, 2009c). After development, groundwater samples will be collected from the wells for laboratory analysis, as described below. Monitor well construction and development activities will be performed in accordance with SOP-7 - 'Groundwater Monitoring Well Installation and Development' (Appendix G).

8.2.1 Well Construction and Development

The monitor well will be constructed: 1) to allow for the collection of groundwater elevation measurements and groundwater quality samples; and 2) with a nominal 15-foot long, 6-inch diameter steel surface casing, and 2-inch diameter schedule 40 polyvinyl chloride (PVC) tubing as the blank (i.e., not screened) portion of the well. Approximately three feet of the steel surface casing will stick up above the ground surface to protect the plastic tubing of the monitor well. A 20-foot, 0.020-inch slotted screen constructed of schedule 40 PVC will be installed at the design interval. A 2-inch flush-threaded PVC end cap will be placed at the bottom of the screened interval. Where necessary, beneath the water table, the borehole beneath the screen and bottom cap will be filled with fully hydrated bentonite grout (nominally 0.375-inch pellets) to three feet below the bottom of the well. Bentonite will be installed via tremmie pipe. Filter pack will begin at the top of the bentonite.

A filter pack consisting of 10/20 silica sand, installed via tremmie pipe, will be placed against the well screen and will extend approximately 3 feet above the top of the screen interval (i.e., 23 feet of filter pack placed in the annulus assuming a 20-foot well screen). A minimum 1-foot thick finer filter-pack layer will be placed on top of the coarser filter pack to limit cement grout intrusion. A bentonite seal will be installed between the top of the finer sand and the cement grout, which will be placed in the annular space from the top of the filter pack to ground surface.

A locking 6-inch diameter well monument will be installed with an approximate 3-foot stick-up above ground surface. A nominal 6-inch thick, 2-foot by 2-foot concrete slab will be placed around the surface casing. The well monument will contain the monitor well name with shallow, intermediate or deep designations (e.g., PA-MW-4S and PA-MW-4D). A permanent water level measurement point will be marked on the PVC well casing inside the monument.

A Nevada-registered surveyor will survey the horizontal and vertical locations of each new monitor well, including the ground surface and top-of-casing elevations. The reference measurement point for taking depth-to-water measurements will be permanently marked on the top of the PVC well casing, and will be surveyed within +/-0.01 foot in relation to mean sea level and within +/- 0.05 foot relative to Nevada State Plane West Zone coordinates (North American Datum [NAD] 27).

After the bentonite grout and cement surface seal has cured, each monitor well would be developed to remove fine-grained material from the well and to improve the hydraulic connection to the screened portion of the alluvial aquifer. Development procedures would include surging the well and periodically pumping or bailing fine grained material until the turbidity of the discharge water is less than or equal to 10 NTUs or has stabilized (i.e., varies less than +/- 10% over three successive casing volumes).

8.2.2 Monitor Well Sampling

The Sub-Area A monitor well will be sampled on a quarterly basis and submitted for laboratory analysis of the constituents listed in Table 8-3. Groundwater samples will be collected from the newly installed monitor well using dedicated pumps and low-flow (minimal drawdown) sampling procedures that are consistent with EPA guidance (EPA, 1996). Groundwater sampling will be conducted in accordance with SOP-9 - 'Groundwater Sample Collection' as well as any additional requirements identified in the Site-Wide Groundwater Monitoring Plan. Decontamination of non-dedicated equipment used to purge and sample the monitor wells (if any) will be conducted in accordance with the QAPP - Revision 5 and SOP-5 'Equipment Decontamination'. After the initial sampling activities, the monitor well will be included in the quarterly monitoring program performed by ARC (Brown and Caldwell, 2010).

Table 8-3. Analyte List for Monitor Well Sampling

Parameter or Analyte	Total/ Dissolved	Method	Reporting Limit	Units
Physical Parameters and Major Anions/Cations				
Alkalinity (Total as $CaCO_3$)	Total	SM 2320B	2.0	mg/L (as $CaCO_3$)
Bicarbonate (HCO_3 as $CaCO_3$)	Total	SM 2320B	2.0	mg/L (as $CaCO_3$)
Carbonate	Total	SM 2320B	2.0	mg/L (as $CaCO_3$)
Chloride	Total	EPA 300.0	0.5	mg/L
Fluoride	Total	EPA 300.0	0.5	mg/L
Nitrate	Total	EPA 300.0	0.1	mg/L as N
Nitrite	Total	EPA 300.0	0.1	mg/L as N
Sulfate	Total	EPA 300.0	0.5	mg/L
pH	Total	SM 4500B	0.1	pH Units
Total Dissolved Solids (TDS)	Total	SM 2540C	10	mg/L
Total Organic Carbon (TOC)	Total	SM 5310B	1.0	mg/L
Metals				
Aluminum	Dissolved	EPA 200.7	0.05	mg/L
Antimony	Dissolved	EPA 200.8	0.002	mg/L
Arsenic	Dissolved	EPA 200.8	0.001	mg/L
Barium	Dissolved	EPA 200.8	0.001	mg/L
Beryllium	Dissolved	EPA 200.8	0.0005	mg/L
Boron	Dissolved	EPA 200.7	0.05	mg/L

Table 8-3. Analyte List for Monitor Well Sampling

Parameter or Analyte	Total/ Dissolved	Method	Reporting Limit	Units
Metals - Continued				
Cadmium	Dissolved	EPA 200.8	0.001	mg/L
Calcium	Dissolved	EPA 200.7	0.1	mg/L
Chromium	Dissolved	EPA 200.8	0.002	mg/L
Cobalt	Dissolved	EPA 200.8	0.001	mg/L
Copper	Dissolved	EPA 200.8	0.001	mg/L
Iron	Dissolved	EPA 200.7	0.04	mg/L
Lead	Dissolved	EPA 200.8	0.001	mg/L
Lithium	Dissolved	EPA 200.8	0.002	mg/L
Magnesium	Dissolved	EPA 200.7	0.02	mg/L
Manganese	Dissolved	EPA 200.8	0.001	mg/L
Mercury	Dissolved	EPA 245.1	0.0002	mg/L
Molybdenum	Dissolved	EPA 200.8	0.002	mg/L
Nickel	Dissolved	EPA 200.8	0.002	mg/L
Phosphorus	Dissolved	EPA 200.7	0.04	mg/L
Potassium	Dissolved	EPA 200.7	0.5	mg/L
Selenium	Dissolved	EPA 200.8	0.002	mg/L
Silicon	Dissolved	EPA 200.7	0.05	mg/L
Silver	Dissolved	EPA 200.8	0.001	mg/L
Sodium	Dissolved	EPA 200.7	0.5	mg/L
Strontium	Dissolved	EPA 200.7	0.02	mg/L
Thallium	Dissolved	EPA 200.8	0.001	mg/L
Tin	Dissolved	EPA 200.7	0.1	mg/L
Titanium	Dissolved	EPA 200.7	0.005	mg/L
Uranium, Total	Dissolved	EPA 200.8	0.001	mg/L
Vanadium	Dissolved	EPA 200.8	0.002	mg/L
Zinc	Dissolved	EPA 200.8	0.01	mg/L
Radiochemicals				
Gross Alpha	Dissolved	EPA 900.0	1.0	pCi/L
Gross Beta	Dissolved	EPA 900.0	1.0	pCi/L
Radium-226	Dissolved	EPA 903.0	1.0	pCi/L
Radium-228	Dissolved	EPA 904.0	1.0	pCi/L
Thorium-228	Dissolved	HASL 300	1.0	pCi/L
Thorium-230	Dissolved	HASL 300	1.0	pCi/L

Note: EPA laboratory analytical methods and method detection limits are consistent with the QAPP – Revision 5

8.3 Vadose Zone Modeling and Reporting

Vadose zone modeling using the saturated/unsaturated flow code SVFLUX will be conducted to evaluate the potential flux of meteoric water within the tailings and soil underlying Sub-Area A. The model will evaluate vadose zone infiltration flux and seasonal moisture movement into and out of the model domain. A one-dimensional column model will be constructed to characterize the vadose zone for the stratigraphic sequence beneath Sub-Area A.

8.3.1 Material Properties

Unsaturated hydraulic properties characteristics of the tailings and alluvial soils will be specified based on geotechnical laboratory test results including SWCCs, measured saturated hydraulic conductivity (Ksat), grain size analyses, dry and wet bulk density, gravimetric and volumetric water content, and calculated porosity. Laboratory results will be used to model the relationship between unsaturated hydraulic conductivity and moisture content for each of the soil types, which will largely be dependent on the SWCCs. The relationship between unsaturated hydraulic conductivity and moisture content will be modeled with the SoilVision software employing the method of Fredlund, et al. (1997), which were both used in the vadose zone modeling presented in the revised *Removal Action Characterization Data Summary Report* (RAC DSR; Brown and Caldwell, 2009d).

8.3.2 Atmospheric Input Data

Atmospheric inputs to the vadose zone model will consist of precipitation and evaporation. Daily precipitation data will be obtained from the Western Regional Climate Center web site (http://www.wrcc.dri.edu/), for the Yerington, Nevada Coop site #269229. The 15-year climate record, used for the RAC DSR simulations, is summarized in Table 8-4 and includes: 1) the range of average annual precipitation rates expected at the Site, represented by a greater number of below average (dry) years (late 1970s to early 1980s) followed by a shorter number of above average (wet) years (early to mid-1980s); and 2) a high precipitation year (8.99 inches in simulation year 11) that is 75 percent greater than the 5.12-inch annual average for the 95-year period of record (1914 through 2008) at Site # 269229.

Because instantaneous storm events can be problematic in numerical model simulations, storm events are scaled using either a parabolic or tetrahedral shape to smooth this input parameter. The SVFlux software performs calculations such that the total volume of water applied to the soil on any particular day is consistent with input data regardless of the storm shape selected. For the planned simulations, the modeled temporal distribution of precipitation intensity will be globally set to a parabolic distribution over an eight-hour period.

Table 8-4. Annual Precipitation Values for Simulation Period

Simulation Year (Water Year)	Model Precipitation Input (inches/meters)
1 (1972/73)	5.50/(0.1397)
2 (1973/74)	3.13/(0.0795)
3 (1974/75)	5.95/(0.1511)
4 (1975/76)	4.02/(0.1021)
5 (1976/77)	4.69/(0.1191)
6 (1977/78)	4.58/(0.1163)
7 (1978/79)	3.51/(0.0892)
8 (1979/80)	4.61/(0.1171)
9 (1980/81)	3.88/(0.0986)
10 (1981/82)	2.78/(0.0706)
11 (1982/83)	8.99/(0.2283)
12 (1983/84)	7.68/(0.1951)
13 (1984/85)	7.26/(0.1844)
14 (1985/86)	7.96/(0.2022)
15 (1986/87)	3.96/(0.1006)

Evaporation data for the model simulations are based on pan evaporation data for the Lahontan, Nevada Coop site #264349, located approximately 30 miles north of the Site (evaporation data are not available for the Yerington, Nevada Coop site). Pan evaporation data from the Site will not be used because these data represents a period of less than 10 years (the Lahontan site includes approximately 60 years of data). The Lahontan site was selected based on its proximity to the Site, its climatic similarity to the Site, and the data are available as monthly average values for the period of record. Table 8-5 presents these evaporation data as daily average evaporation rate by month.

Evaporation data used in the simulations will be adjusted by a pan coefficient of 0.7 to correct for factors (e.g., storage and transfer of heat to the water from the sides of the evaporation pan), which may increase the evaporation rate in an open pan with respect to the potential evaporation from a crop or bare soil (coefficients vary from 0.35 to 0.85 for agricultural situations; UNFAO, 1998). The pan coefficient effect lowers the potential evaporative flux indicated by the pan evaporation data.

Table 8-5. Daily Average Pan Evaporation Rates from Lahontan, Nevada COOP Station

Month	Daily Average Evaporation (centimeters)
January	0.00
February	0.00
March	0.00
April	0.61
May	0.79
June	0.98
July	1.13
August	1.00
September	0.66
October	0.37
November	0.18
December	0.00

8.3.3 Boundary Conditions

Boundary conditions will be assigned to the upper and lower surfaces of the one-dimensional models (lateral boundaries will be designated as no-flow boundaries). The upper boundary will simulates atmospheric conditions, and the lower boundary will be represented by a gradient boundary because of the approximate 95-foot depth to groundwater beneath Sub-Area A, which will eliminate unrealistic potential of the model to wick soil moisture sourced from the underlying alluvial aquifer.

8.3.4 Initial Conditions

Initial moisture conditions for the models will be developed using SVFlux™ to establish a linear distribution of pressure head between the water table and the upper model boundary. The model will be run until they are at or near equilibrium (i.e., quasi steady-state condition) with boundary conditions prior to assessing model results. Equilibrium will be indicated by a cessation of any long-term drying or wetting trends exhibited by the models.

8.3.5 Interpretation of Model Results

Comparisons of observed versus simulated saturation percentages within the column model will indicate the appropriateness of the numerical model for predictive simulations (i.e., approximating the observed moisture conditions with the models). A tool for monitoring saturation at various locations within the model domain, called point saturation monitors (saturation points), is also provided by SVFlux™. The saturation points provide a history of the degree of saturation at designated locations within the column models for the simulation period, and are used to compare observed with simulated saturation percentage values. Flux lines will be designated in each model to evaluate the movement of soil water at various depths (flux lines are a tool included in SVFlux™ that allows the user to monitor and record the flux of soil water anywhere in the column model). The deepest flux line will be used to estimate deep soil water movement (i.e., whether soil moisture moved up or down, the flux rate, and the total cumulative flux volume).

8.3.6 Reporting

Vadose zone modeling results, along with the other field and laboratory activities associated with the Sub-Area A investigation will be presented to EPA in a Data Summary Report (DSR). The DSR will include: 1) the field logs documenting the drilling, sample collection and handling; 2) a lithologic log for the borehole; 3) details about the monitor well installation including well design and construction, well development and surveying of the wellhead measurement point; 3) laboratory geotechnical and geochemical analyses for the tailings and alluvial soils, and the groundwater chemistry of the collected groundwater sample. ARC anticipates that the DSR will be submitted by June 30, 2011.

SECTION 9.0
HEALTH AND SAFETY REQUIREMENTS

All field activities will be conducted in accordance with the Site Health and Safety Plan (HASP; Brown and Caldwell, 2009e). The HASP identifies, evaluates and prescribes control measures for health and safety hazards, including radiological hazards, and describes emergency response procedures for the Site. HASP implementation and compliance is the responsibility of Brown and Caldwell, with ARC taking an oversight and compliance assurance role. Copies of the HASP are located at the Site and are available to all Site workers. The HASP includes site specific requirements and procedures including:

- Safety and health risk or hazard analysis;
- Employee training requirements;
- Personal protective equipment (PPE);
- Medical surveillance;
- Site control measures (including dust control);
- Decontamination procedures; and
- Emergency response.

9.1 Training

All Site workers and subcontractors will receive applicable training, as outlined in 29 CFR 1910.120(e), and as stated in the HASP. Site-specific training will be covered at the pre-entry briefing, with an initial Site tour and review of Site conditions and hazards. Records of pre-entry briefings will be maintained at the project site. Planned training elements include:

- Persons responsible for site-safety;
- Site specific safety procedures;
- Site-specific safety and health hazards;
- Project and task specific work risk assessment and mitigation;
- Use of PPE;

- Decontamination procedures; and
- Emergency response procedures.

Other required training, depending on the particular activity or level of involvement, that will be completed prior to beginning work at the Site includes the following. Sub-contractors and Site workers will provide copies of the following certification records to the Project Safety Manager:

- OSHA 40-hour training with current 8-hour refresher,
- OSHA 10-hr or 30-hr construction safety.

9.2 Personal Protective Equipment

Minimum PPE requirements required for transite pipe removal action activities include:

- hard hat;
- safety glasses;
- steel-toe boots;
- long-sleeve shirts;
- high-visibility clothing or reflective vest; and
- nitrile and/or leather work gloves (as needed).

Additional PPE may be required depending on the work task and may include, but is not limited to Tyvek coveralls, rubber boots, and/or hearing protection.

9.3 Construction Related Health and Safety Procedures

Health and safety issues related to construction activities (e.g. borrow area excavation, hauling and capping) include ground disturbance, airborne dust and vehicle traffic. A variety of heavy equipment will be used including loaders, spreaders, haul trucks, graders or other equipment. Precautions shall be taken to ensure equipment is selected and used properly and is operated by qualified and trained operators.

9.3.1 Ground Disturbance

All construction, demolition or other activities that results in ground disturbance must be evaluated for potential buried utilities that could interfere or create a safety hazard. The borrow source areas are in existing mine waste units and are not expected to have any active or inactive underground utilities, therefore ground disturbance safety requirements in these areas shall be limited to an initial visual survey to confirm no potential utilities or pipeline, but ground disturbance permits shall not be required for these areas. Haul road construction activities that consist of digging or ripping existing mine roads shall be evaluated for potential utilities and pipelines through utility location procedures and ground disturbance permits issued by Brown and Caldwell to the contractor.

9.3.2 Dust Control and Air Monitoring

Dust will be generated during the loading, hauling and dumping activities. The dust source will be VLT oxide waste material and may contain elevated levels of some metals, however, the metals concentrations are not expected to be at hazardous levels or to exceed OSHA permissible exposure levels (PEL). Dust control measures will be implemented and air monitoring at work areas, haul roads and at the mine perimeter will be conducted as described in Section 6.0. Workers are not expected to be required to wear any level of respiratory protection, however, if monitoring identifies an inhalation concern respirators may be required in select areas. If respirators are required for any workers, Brown and Caldwell's respiratory protection program requirements shall be followed including medical evaluation of each worker and fit testing and training on the use of respirators.

9.3.3 Traffic Control

A traffic control plan will be established at the start of the removal action by the selected contractor to define access routes that trucks and equipment are allowed to use (or are excluded from), designated directions of travel, areas limited to one-way traffic, and traffic management procedures for areas with two-way traffic or intersections. All removal action-related traffic will be confined to the Site with the exception of mobilization to and from the site at the beginning and end of the removal action. Traffic control on public roadways will not be required.

9.4 Work Risk Assessment

Work Risk Assessment (WRA) is a risk management tool for the identification and ranking of hazards associated with all aspects of a specific job before and after implementation of risk controls and preventive actions. Control of the hazards can be accomplished by elimination or substitution of the task, isolation of Site workers from the hazard, use of engineering or administrative controls, and/or the use of PPE. The WRA for the removal action described in this RAP is provided in Appendix H. A summary of potential hazards associated with the removal action activities described in this RAP is provided in Table 9-1.

Detailed Task Safety and Environmental Analyses (TSEAs) will be created for each of the individual tasks that comprise the removal action prior to implementation of the work. TSEAs are similar to job safety analyses (JSAs), but include potential risks to the environment. Comprehensive TSEAs will be completed for all field tasks required in this RAP before the work is initiated and will be developed jointly by the field staff conducting the work and the Project Safety Manager. TSEAs will be kept at the Site at all times and will be reviewed by Site workers prior to, and throughout, the removal actions in order to identify new hazards or controls.

Table 9-1. Work Risk Assessment Summary

Field Activities	Potential Hazards
Road construction and improvements	▪ Driving on soft unstable sediments to build the roadways onto Sub Area A ▪ Cut & fill work to widen/straighten existing mine roads, could encounter subsurface utilities or old pipelines. ▪ Hazards associated with working with large pieces of heavy equipment.
Excavation of borrow materials	▪ Potential to undercut steep highwalls in borrow areas and cause collapse that could engulf workers. ▪ Working around heavy equipment with limited visibility could result in collision of vehicles. ▪ Potential to encounter unknown or unsuitable material during excavation. ▪ Dust generation.
Haul cover material to pond areas	▪ Increased traffic on roads and areas with cross-traffic could result in collision with other vehicles. ▪ Some areas will have narrow roads with one-way traffic, will need to establish a traffic plan and traffic control signs. ▪ High speeds, steep slopes or limited protective berms could result in loss of control of haul trucks. ▪ Dust generation.
Backfill capping in pond areas	▪ Dump and push fill material, working around heavy equipment with limited visibility. ▪ Potential for areas with soft unsupportive sediments where equipment could become mired.
Drill and install monitor well	▪ Rotating and up/down motion of drill could strike or entangle workers. ▪ Noise hazard. ▪ Potential to contact acidic pond sediments and groundwater.

SECTION 10.0
INTEGRATED REMOVAL ACTION SCHEDULE

The integrated schedule for the Evaporation Ponds Removal Action includes a phased approach for the placement of interim covers on the ponds and Sub-Area A in 2010, followed by a second phase in 201 for the LEP and UEP. As indicated in Section 1.0, the planned construction of interim covers for the Thumb Pond and Sub-Area A will use VLT materials. Because of the relatively shallow depth to groundwater beneath the LEP and UEP, alternative interim cover materials may be used pending the results of the Cover Materials Characterization Work Plan (also to be submitted in June 2010). Following EPA review of the Cover Materials Characterization Work Plan DSR, a decision will be made regarding the materials to be used to construct the LEP and UEP interim covers. In addition, the schedule associated with the XRF Work Plan, to provide field screen criteria for VLT materials, is integrated into the following milestones:

- VLT XRF field program completed May 2010
- Revised Implementation Work Plan - June 18, 2010
- Draft Cover Materials Characterization Work Plan - June 25, 2010
- XRF sample laboratory non-validated data available - June 21, 2010
- EPA approval of revised Implementation Work Plan - July 9, 2010
- Develop correlation/assessment of XRF field and laboratory analytical and submit XRF Work Plan DSR with validated data – July 15 and September 1, 2010
- Cover Materials Work Plan Approval by EPA - July 30, 2010 (or later pending EPA and stakeholder comments)
- ARC contractor procurement for construction of the Thumb Pond and Sub-Area covers - June 15 through August 1, 2010
- Provide EPA with supplemental information resulting from procurement activities (e.g., contractor-suggested engineering or AQM modifications, XRF field screening implementation) - August 1, 2010
- Construct interim covers on Sub-Area A and Thumb Pond - August1, through November 30, 2010 (Sub-Area A cover to be placed first to accelerate surface investigation)

- Cover Materials Work Plan field sampling and analysis - August 16 through December 31 2010 (time period includes soil water characteristic curve evaluation)
- EPA Site visit to review Thumb Pond and Sub-Area A construction - week of October 15, 2010
- Sub-Area A Investigation FSAP - October 15, 2010 through April 29, 2011 (time period includes soil water characteristic curve evaluation and vadose zone modeling)
- Cover Materials DSR compilation and reporting - November 15, 2010 through March 21, 2011
- Thumb Pond and Sub-Area A Removal Action Report - February 21, 2011
- EPA review of Cover Materials DSR, follow-up discussions, and the selection of cover materials to cover the LEP and UEP - March 21 through April 22, 2011
- Revised Implementation Plan for the LEP and UEP – April 1 through June 1, 2011
- Sub-Area A Characterization DSR – April 29, 2011
- Contractor procurement for LEP and UEP covers - April 1, through June 15, 2011
- LEP and UEP cover construction – June 15, through December 15, 2011
- EPA site visit - January 16, 2012
- Final LEP and UEP Removal Action Report - March 15, 2012

These activities and planned milestones are presented in a Gantt Chart (Microsoft Project) in Appendix I. Supplemental information from ARC's contractor regarding means and methods will be submitted to EPA when available. Milestone dates for the latter part of 2010 and 2011 should be considered preliminary, and will be updated at a frequency agreed upon with EPA.

SECTION 11.0

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